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PSYCHOLOGY AND SCIENTIFIC METHODS

OF NEURURGIC AND NOETIC CORRESPONDENCES

I.

IN these days our masters in psychology teach us to throw aside the psychological atomism of our forefathers, and ask us to look upon consciousness as systemic in its nature. That this modern teaching is warranted I fully agree, and in fact am inclined to hold that our conception of systems existing in the physical world is gained only through the recognition in a marked form in nature of certain of the characteristics which we find within consciousness itself.

Of all the systems existing in the physical world the most interesting to the psychologist is the human nervous system, and this because of our discovery that changes in the degree of the activities within this nervous system correspond in some way with modifications within consciousness.

The acute investigations of the neurologist during the last century have enormously increased our knowledge of the nature of this nervous system; and have brought out clearly one fact which seems to the writer to be of great importance to the psychologist. They have taught us that the nervous system is not a simple system, but is really a system of minor systems of hypothetical nervous elements. Within the nervous system, taken as a whole, we find minor nervous systems of the first order, one (α) which has to do with environmental stimulation; another (β) which has to do with the organism's reaction upon its environment; and another very broad system (γ) which has to do with with the coordination of minor nervous systems α and β. But within these minor nervous systems of the first order we find minor nervous systems of lower orders, one within another in indefinite number. Each minor nervous system of one of the lower orders is integrated, as we say, and has its characteristic individuality; but these minor nervous systems of the lower orders are interrelated and integrated to form broader minor systems, and all

of these latter are bound together to form the highly complex nervous system as a whole.

This being so, it is exceedingly interesting to note that the introspective psychologist in like manner discovers, not only that consciousness is systemic, but that it is a vastly complex system of minor psychic systems. We find, for instance, minor psychic systems of what we may call the first order; (A) sensations, which have to do with environmental stimulation; (B) instinct feelings, which have to do with reaction upon the environment; and (C) the very broad realm of ideas,—of thoughts, which has to do with the coordination of minor psychic systems A and B. But within these minor psychic systems of the first order we find minor psychic systems of a second order. In the realm of sensation we have light, sound, etc.; in the realm of instinct-feeling various types of emotion, for instance, love, anger, etc.; and in the realm of thought a vast array of what, following Stout, we may call apperceptive systems. And beyond this, within each of these minor psychic systems of the second order we find an indefinite number of minor psychic systems of still lower orders. Each minor psychic system of one of the lower orders is integrated, as we say, and has its characteristic individuality; but these minor psychic systems of the lower orders are interrelated and integrated to form broader minor psychic systems, and all of these latter are bound together to form the highly complex psychic system which we call consciousness.

In this and later articles, which through the courtesy of the editor will appear in successive numbers of this JOURNAL, I shall ask the reader to consider the meaning of, and certain implications of, this fact that consciousness is a complex system of minor psychic systems.

II.

In the remainder of this article I shall consider briefly the nature of the correspondence between nervous activities and modification within consciousness. And in the beginning I may say that it seems perfectly clear to me that, if we had discovered the broad correspondence above considered before we had been taught to believe that the activities of the cortex of the brain are alone concerned with modifications of consciousness, we would not have considered this latter hypothesis tenable. On the contrary, we would have assumed that the correspondence between what I have called neururgic[1] and noetic changes is thoroughgoing; that not only is there no modification of consciousness without a neururgic change; but

[1] There is no word in current use signifying 'relating to the activity of nerve.' I have therefore used this term in previous writings as a convenient one to express this meaning.

that no neururgic change can occur without a corresponding modification of consciousness.

We would have made this assumption because, with the data before us, and without the preconceptions with which we now approach this subject, we would consider the problem somewhat as follows:

We would begin with the assumption, which I think we are entitled to make, that each nervous element is in some measure active so long as it is alive. If this is true, then whenever we observe what we call a special activity in a part of the nervous system we are dealing really with what is merely an emphasis of activity in a special part of an all-active system.

If we thus assume that all parts of the living nervous system are active, then we may symbolize its neururgic condition in spatial terms by conceiving the neural elements to be spread out on a plane; and so distributed that each neural element would be represented by a little square on a flat surface divided by two sets of equidistant lines drawn at right angles to one another. We may then represent the amount of activity of each element by a certain rise of its corresponding little square above the plane. In any moment considered all elements would rise to some degree above the plane; but some elements would rise higher than others, and the neururgic condition of the whole system would then be comparable to the surface of a liquid on which would appear a wave pattern.

That is, at each moment the nervous system as a whole displays what we may call a *neururgic pattern,* in which certain parts are more markedly active than others. The markedly active parts are not the only active parts; but their activities are set over in contrast with the great body of less markedly active parts, which latter form an undifferentiable mass of minor activities against which specially marked activities appear as *emphases* of activity.

Having thus represented to ourselves the condition of the ever active nervous system we would then argue that, if the neururgic and noetic correspondence is thoroughgoing, the condition of consciousness at any moment may be described in similar terms as follows. At each moment, consciousness, which is a vastly complex noetic system of systems, displays what we may call a *noetic pattern* in which certain psychic parts are more emphatic than others. The markedly emphatic parts are not all there is of consciousness in any moment under consideration, but these markedly emphatic parts are merely set over in contrast from the great body of less emphatic parts; which latter form an undifferentiable mass of minor psychic parts against which the specially emphatic parts appear as psychic *emphases.*

And this we would find to accord with experience. For in the first place, we have what is generally agreed to be ample evidence that the psychic states which we designate as the field of attention, (what under our terminology we would call the noetic emphases), do correspond with emphatic activities in parts of the nervous system, (what I would call the emphases of activity in the neururgic pattern).

This being granted, the question would arise whether there exists an undifferentiable noetic mass against which these noetic emphases are contrasted, corresponding with the undifferentiable neururgic mass against which the neururgic emphases are contrasted. And to this question we would not hesitate to give an affirmative answer. For we note that the field of attention, if we may use a current ocular simile, spreads out from a clear focus to a margin, and this margin to 'fringes,' and these 'fringes' to a vague and illusive aura. Even if we experience the most punctual of vivid sensations, for instance, it does not seem to exhaust the consciousness of the moment; there is always felt to be a something more of consciousness of the moment when the sensation appears; its appearance clearly does not involve the annihilation of this rest of consciousness. And this becomes clearer in the fact that we have come to speak of these clear elements of attention as presentations. If they are properly so called, they must be presentations to something; and under our view that to which they are presentations, or, as I should prefer to say, increments, is the undifferentiable mass of unemphatic psychic parts which constitutes what we may well speak of as the *field of inattention.*

This field of inattentive consciousness we would hold must always exist while life exists, and we would, therefore contend that the common man is wrong in stating that we are unconscious during sleep or in states of coma. And if evidence in favor of this statement were demanded we would in turn demand from our critic evidence that inattentive consciousness does not exist under such conditions; asking him to note that the only evidence he has to offer in favor of his contention is the fact that he is unable to recall in full-awake life any psychic events of the moments of what he calls unconsciousness; and showing him that his argument if valid would compel him to hold that he is unconscious in all moments where the psychic events fail of recall in later moments, which would force him to refer all forgetfulness to moments of unconsciousness in the past, a position which is, of course, untenable.

We would then have before us for explanation the facts which in the main have led to the adoption of the current theory that the 'brain is the organ of mind,' viz., (1) the fact that the occurrences within the field of attention, or, as we should say, the noetic em-

phases, correspond in general with emphatic activities in the cortex of the brain; and (2) the fact that a large mass of activities in parts of the nervous system, other than the cortex of the brain, are not accompanied by any noticeable modifications of consciousness.

(1) The first fact we would restate in terms of the theory of a thoroughgoing neururgic and noetic correspondence by saying that the mass of noetic emphases corresponds with neururgic emphases within the brain.

And this would seem to us to be a most natural condition, for a number of reasons: (1) because so large a mass of the nervous system is crowded into the brain, where the various parts are cross connected and interrelated as is impossible in other parts of the system; (2) because, in consequence of this fact, and in consequence of the close relation of the brain to the most highly elaborated sense organs, a very large variety of diverse and forceful stimuli from the environment are brought to bear upon the brain; and (3) because the brain part of the system, if genetically considered, appears to be of late development; and this being so, it must be supposed, speaking broadly, to be markedly mobile, as it were, less fixed in the interrelations of its parts, and more subject to disturbances of normal functioning, than is the case with the other parts of the whole nervous system.

(2) As to the second point we would, of course, agree that a large mass of activities, in parts of the nervous system other than the brain, are not accompanied by any *noticeable* modifications of consciousness; but we would hold that this does not stand in opposition to the hypothesis that the psychic correspondents of these activities exist, but are part and parcel of the vast undifferentiable psychic mass, *i. e.*, the field of inattention.

III.

And here we find our theory throwing light upon an important problem which is not touched by the currently accepted view. For we note that typical reactions which seem invariable are, broadly speaking, what men call unconscious; or, as we should say, have accompanying them only such psychic correspondents as are wholly within the field of inattention; while, on the other hand, variant actions in general are the ones which have correspondent with them emphases within the field of attention.

As a preliminary to the study of the problems which these facts present to us, let us consider for a moment the basis of what we call variation in the form of animal activities.

If we could isolate a living cell we must assume that it would react in a definite way to appropriate stimuli, and its reactions we may, if we choose, call its 'instinct-actions.'

Now if a number of such cells (for simplicity let us say 5), are brought into relation as a little organism; and if each of the cells retains specific modes of instinct action;[2] then, if we consider the group rather than its elements, the combined instinct actions of the elements would give what would appear as a specific instinct action of the whole group, or little organism.

The normal instinct actions of the five elements would together constitute the normal instinct action of the group. But if the instinct action of one of the five elements should be, *not changed in character, but merely markedly emphasized,* then the normal instinct action of the group would be modified. This emphasis of activity in the element would thus appear to be the basis of modification of the instinct action of the group taken as a unit.

If now we suppose that for each of these five elements is substituted a little system of five elements; then we would have a system of five minor systems of five elements each. Each of these five minor systems would display its own group instinct actions; and the instinct actions of all the five minor systems would give us what we would call the normal instinct action of the whole system of five minor systems.

Here again; if the instinct action of a special minor system within the group of five, were not changed in character, but merely became emphatic, the typical instinct action of the group taken as a whole would appear to be modified. And even if the instinct action of only one element in one minor system were emphasized, its little minor system's typical instinct action would be modified, and thus also we should have a modification of the typical instinct action of the whole large organism. It would thus appear that modification of the normal instinct actions of such a simple organism of 25 elements could all be traced back to mere emphases of activity in some of the minor systems, or in the elementary parts themselves.

If this is the process of modification in such a case as I have pictured, it is easy to see how complex might be the modifications of the typical instinct actions of an enormously complex system of minor systems such as the human nervous system is; and nevertheless it might well be that these variations of mode of instinct action of the organism as a whole might be all of them traceable back to mere emphases of the instinct actions in some of the minor nervous systems, and then farther back still to a mere emphasis of the instinct action in some element of a minor nervous system.

Emphases of activity in minor parts would thus appear to be

[2] These will of course be different from the instinct actions of the cell when in isolation.

the basis of modification of instinct actions of the organism as a whole.

If all this is true we should certainly be led to expect to find exactly what we do discover; viz., that variant activities, being those which involve neururgic emphases, must also involve noetic emphases; while typical, and apparently unmodified, activities do not involve either neururgic or noetic emphases. In other words the psychic correspondents of those of our instinct actions which are typical and relatively unmodifiable (*e. g.*, our 'reflex actions') are almost wholly within the field of inattention; while variations from these typical forms of reaction have corresponding with them forms of consciousness which we speak of as intelligent.

Corroboration of this special point is had if we ask ourselves how these emphases of activity within the nervous system may be brought about.

(1) In the first place, in all organisms, from the simplest to the most complex, they would certainly be in great part determined by the energy of stimuli reaching the parts of the system from the environment of the whole system.

But when the organism is very complex, emphases within minor systems might be due to influences quite within the whole system; appearing in parts of that system which are environmental, as it were, to the minor system whose activity is emphasized when modification occurs.

(2, A) But these influences within the complex system, which thus produce emphases of activity in one of its minor systems, might themselves be emphatic activities in other minor systems; or on the contrary, (2, B) they might arise out of the great undifferentiable mass of unemphatic activities against which the emphases of activity are contrasted.

If then our theory of a thoroughgoing neururgic and noetic correspondence is true we should expect to find (1) the most marked form of these variations, as thus connected with states of attention, distinctly related to the reception of environmental stimuli. That this is true is clear.

But beyond this, as we have seen that the emphases to which modifications of activity are due may be the result of influences arising within the whole nervous system, and (2, A) as the result of specially emphatic activities already existing within the system; so we should expect to find the emphases within consciousness accompanying modifications of instinct action often due to emphatic influences within the conscious system itself; and this we surely do find in the stream of thought which runs parallel with a large proportion of those variations of activity which we observe in ourselves.

In this stream each emphasis in attention seems to be influential in producing its successor.

But finally, (2, B) as we have seen that the neururgic emphases to which variations of activity are due may be the result of influences arising out of the great undifferentiable mass of unemphatic activities against which the emphases of activity are contrasted; so we should expect to find the emphases within consciousness, which accompany variations of activity, determined often by influences which are felt to arise out of the undifferentiable psychic mass of unemphatic psychic states; *i. e.*, we should expect to find the field of attention at such times determined by obscure influences from the field of inattention. And this we surely do find in what is called voluntary attention; *i. e.*, in attention which is maintained as such by the reaction of the whole system of consciousness. And in this, as all psychologists acknowledge now-a-days, we have the root of that modification of our reactions upon the outer world which we describe as due to volition.[3]

In the preceding paragraphs I have presented a version of the theory of neururgic and noetic correspondences which enables us to hold that it is thoroughgoing. The test of a theory lies in the explanation it enables us to give of facts of experience which otherwise baffle us. In the articles to follow this I shall first attempt to show that if we accept the theory thus outlined we are able to answer certain questions of interest and importance; and shall then trace some implications of the theory which have bearing upon current psychological problems.

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DIMENSIONAL EQUATIONS AND THE PRINCIPLE OF THE CONSERVATION OF ENERGY

PHYSICISTS generally consider that the assumption of three independent quantities as fundamental dimensions is necessary and sufficient. Time, space and mass are usually selected as elemental, and expressions for physical units, in terms of these three, are called the dimensional equations of these quantities. In Table I. (accompanying) the usual expressions for the more common physical quantities are given.

[3] The relation between intelligence and variation from typical forms of reaction I have discussed at length in my 'Instinct and Reason': the limits of this paper prevent any further consideration of it here. Cf. especially Chapter XVII.

The selection of time and space as fundamental is inevitable, as these are respectively the 'forms' of the inner and outer experience of our consciousness, but the use of mass as the third dimension is open to serious objections. It may be noted that much confusion is caused by the indiscriminate use of the terms mass and matter. The hypothesis of matter as being something behind the concept of mass—*i. e.*, the existence of a great variety of inert bodies divisible into molecules, atoms, electrons, ions or what not, causing the phenomena of mass—is purely metaphysical and entirely without any physical basis. Mass free from the matter hypothesis is real, but a complex quantity containing the time and space factors, and hence should not be used as a fundamental dimension.

The basis of modern physics is the principle of the conservation of energy, and upon this dogma rests the whole superstructure of quantitative measurements. Energy is considered an invariant in amount through all its transmutations, the sum total remaining the same to-day, yesterday and forever; *i. e.*, energy is independent of time and space. It can also exist where there is no mass, witnesseth: the transmission of energy through vacua in the forms of light, radiant heat, electromagnetic waves, Roentgen rays, etc. But in Table I. (giving the system now in general use) the dimensions of energy (work) are given as L^2MT^{-2}. Evidently this is a contradiction of the principle just stated and, therefore, if the conservation of energy dogma be accepted, mass can not be independent of time and space dimensions. Further, since all our knowledge of mass comes to us through our senses by means of energy-changes in time and space, it would seem more logical to consider energy the simple and mass the complex quantity.

Using E as the symbol of energy, and solving the dimensional equation for energy, as given in Table I. ($E = L^2MT^{-2}$), we have $M = L^{-2}ET^2$. Mass is thus a complex quantity, having the dimensions of space, energy and time, or, in other words, mass is energy divided by the square of a velocity.

If mass be a complex quantity, time and space are erroneously introduced or omitted wherever mass occurs in the dimensional equation. Substituting for mass its dimensions in Table I., a new system of dimensional equations is derived in which the fundamental quantities are space, energy and time. This system is founded upon the principle of the conservation of energy and is thus in accord with the fundamental law of modern physics. The resulting equations given in Table II. express directly the nature of each unit as we are accustomed to think of them. For example, in mechanical quantities, power $= ET^{-1}$ = energy per unit of time; and force $= EL^{-1}$, *i. e.*, force times space = energy.

TABLE I.

Physical Quantity.	Dimensions.	
Fundamental:		
Length	L	
Mass	M	
Time	T	
Geometric:		
Surface	L^2	
Volume	L^3	
Mechanical:		
Velocity	LT^{-1}	
Angular velocity	T^{-1}	
Acceleration	LT^{-2}	
Angular acceleration	T^{-2}	
Force	LMT^{-2}	
Work	L^2MT^{-2}	
Power	L^2MT^{-3}	
Pressure	$L^{-1}MT^{-2}$	
Momentum	LMT^{-1}	
Moment of a couple	L^2MT^{-2}	
Moment of inertia	L^2M	
	Electrostatic.	Electromagnetic.
Magnetic Quantities:		
Strength of pole	$L^{\frac{1}{2}}M^{\frac{1}{2}}$	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetic moment	$L^{\frac{3}{2}}M^{\frac{1}{2}}$	$L^{\frac{5}{2}}M^{\frac{1}{2}}T^{-1}$
Intensity of magnetization	$L^{-\frac{3}{2}}M^{\frac{1}{2}}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Field intensity	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetic potential	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetic induction	$L^{-\frac{3}{2}}M^{\frac{1}{2}}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetizing force	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Permeability	$L^{-2}T^2$	A number
Reluctance	LT^{-2}	L^{-1}
Magnetic flux	$L^{\frac{1}{2}}M^{\frac{1}{2}}$	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$
Magnetomotive force	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Reluctivity	L^2T^{-2}	A number
Susceptibility	$L^{-2}T^2$	A number
Electrical Quantities:		
Resistance	$L^{-1}T$	LT^{-1}
Electromotive force	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$
Current	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$
Quantity of electricity	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}$
Surface density	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{-\frac{3}{2}}M^{\frac{1}{2}}$
Capacity	L	$L^{-1}T^2$
Specific inductive capacity	A number	$L^{-2}T^2$
Electric force or intensity of electric field	$L^{-\frac{1}{2}}M^{\frac{1}{2}}T^{-1}$	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-2}$
Electric energy	L^2MT^{-2}	L^2MT^{-2}
Electric power	L^2MT^{-3}	L^2MT^{-3}
Resistivity (specific resistance)	T	L^2T^{-1}
Conductance	LT^{-1}	$L^{-1}T$
Conductivity (specific conductance)	T^{-1}	$L^{-2}T$
Coefficient of induction	$L^{-1}T^2$	L

TABLE II.

Physical Quantity.	Dimensions.	
Fundamental:		
Length	L	
Energy	E	
Time	T	
Geometric:		
Surface	L^2	
Volume	T^3	
Mechanical:		
Velocity	LT^{-1}	
Angular velocity	T^{-1}	
Acceleration	LT^{-2}	
Angular acceleration	T^{-2}	
Mass	$L^{-2}ET^2$	
Force	$L^{-1}E$	
Work	E	
Power	ET^{-1}	
Pressure	$L^{-3}E$	
Momentum	$L^{-1}ET$	
Moment of a couple	E	
Moment of inertia	ET^2	
	Electrostatic.	Electromagnetic.
Magnetic Quantities:		
Strength of pole	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{\frac{1}{2}}E^{\frac{1}{2}}$
Magnetic movement	$L^{\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{\frac{3}{2}}E^{\frac{1}{2}}$
Intensity of magnetization	$L^{-\frac{5}{2}}E^{\frac{1}{2}}T$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Field intensity	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Magnetic potential	$L^{\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$
Magnetic induction	$L^{-\frac{5}{2}}E^{\frac{1}{2}}T$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Magnetizing force	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$
Permeability	$L^{-2}T^2$	A number
Reluctance	LT^{-2}	L^{-1}
Magnetic flux	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{\frac{1}{2}}E^{\frac{1}{2}}$
Magnetomotive force	$L^{\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$
Reluctivity	L^2T^{-2}	A number
Susceptibility	$L^{-2}T^2$	A number
Electrical Quantities:		
Resistance	$L^{-1}T$	LT^{-1}
Electromotive force	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$	$L^{\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$
Current	$L^{\frac{1}{2}}E^{\frac{1}{2}}T$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}$
Quantity of electricity	$L^{\frac{1}{2}}E^{\frac{1}{2}}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T$
Surface density	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$	$L^{-\frac{5}{2}}E^{\frac{1}{2}}T$
Capacity	L	$L^{-1}T^2$
Specific inductive capacity	A number	$L^{-2}T^2$
Electric force or intensity of electric field	$L^{-\frac{3}{2}}E^{\frac{1}{2}}$	$L^{-\frac{1}{2}}E^{\frac{1}{2}}T^{-1}$
Electric energy	E	E
Electric power	ET^{-1}	ET^{-1}
Resistivity (specific resistance)	T	L^2T^{-1}
Conductance	LT^{-1}	$L^{-1}T$
Conductivity (specific conductance)	T^{-1}	$L^{-2}T$
Coefficient of inductance	$L^{-1}T^2$	L

Especially in the magnetic and electrical quantities is there a great advantage in eliminating the mass dimension and using energy with time and space in its stead. Take, for example, the strength of pole in the electro-magnetic system. This quantity is derived from the experimentally observed fact that between two equal and opposite magnetic poles, of strength 'm,' and at a distance 'l' apart, there is a force which is proportional to m^2/l^2. Hence $m^2 = FL^2$. But $E = FL$, hence $m^2 = EL$, and therefore $m = E^{\frac{1}{2}}L^{\frac{1}{2}}$. The superiority of this expression to $L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}$ in practice, as well as in theory, will be admitted by all.

It is noteworthy that all the magnetic quantities in the electro-magnetic system are independent of time. From the usual conception of these quantities this evidently should be the case, and it appears that the time dimension given in Table I. is erroneously introduced by the use of mass as a fundamental quantity. It is, however, unnecessary to go further into detail. The expressions in Table II. are so plain that 'he who runs may read.'

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DISCUSSION

DR. MONTAGUE'S THEORY OF TIME-PERCEPTION

IN the January number of *The American Journal of Psychology* for 1904, Dr. W. P. Montague has given a theory of time-perception and in particular, of the specious present, which is so clear-cut and ingenious as to be well-nigh captivating. And yet, after reading this article, I cannot refrain from calling attention to one or two points which, as it seems to me, need at least some reconsideration.

If I have correctly read Dr. Montague, he sets out to explain how that finitely extended segment of time in the individual consciousness known as the 'specious present,' can exist in the metaphysical present which is infinitesimal, that is, which is a segment of time whose extent is zero. "How is it that at any one moment there can appear to be present several moments?" "Every psychosis," he continues, "has two distinguishable but inseparable aspects, the subjective and the objective. The subjective element or 'knowing thought' is the whole system of conscious contents taken collectively and *including the incoming content*" (my italics), "while the latter is the *object* of the (normally prospective) act of attention. . . . We may describe every psychosis as the assimilation of an entering sensation-mass by a receiving apperception-mass." The explanation is: "Let Δo symbolize the amount of change or alteration in the objective content o produced in any

period of time Δt, and let Δs symbolize the resulting change produced in the subjective aspect of consciousness during the same time. Then $\frac{\Delta o}{\Delta s}$ will represent a change in the objective as compared with the change in the subjective element in the time Δt. As Δt is made to decrease without limit, Δo and Δs will correspondingly decrease, but the fraction $\frac{\Delta o}{\Delta s}$ will not necessarily decrease, but will either approach, or if the rate of change be uniform, will maintain the finite value $\frac{do}{ds}$. Now this derivative of the objective change with regard to the change of the subjective element is a finite quantity, but one that is realized at each infinitesimal moment of time.''

As Dr. Montagues says, he is applying calculus to increments of change, as it is ordinarily applied to increments of substance; and the one kind of increment produced in a conscious state differs from the other in that the increment of change, 'while it varies directly with the stimulus causing it, also varies inversely with the content in which it is caused.' This is already a prime difference, and suggests that before 'change' is subjected to ordinary differentiation it should be examined to see if this novel property does not need to be taken into account. But there is a more striking and pertinent difference between change and substance; the latter is defined without reference to time while the former can not be. An amount of change is always an amount of change in a certain amount of time, that is a *rate of change.* Therefore the increment in the amount of change ('produced in any period of time Δt') which Dr. Montague symbolizes with Δo or Δs, has to be an acceleration in the rate of change of o or s. It follows that $\frac{do}{ds}$ is already what Dr. Montague wishes to call a second derivative. Now this quantity would not serve to represent or to explain the peculiarities of the specious present, as may be seen from a single illustration: when the rate of change is constant, the ideal condition supposably for a perfectly normal specious present, the derivative is zero. That is, there is no specious present.

The force of this criticism comes out specially if, as Dr. Montague suggests, one interprets his quantitative symbols 'as applying to the physiological concomitants of conscious states'; for it is obvious enough that any change in physiological processes can not be defined except as change taking place in a certain amount of time, that is, except as rate of change, so that any *increment* of change would have to be an acceleration in this rate.

Apart from this difficulty, there would come up another and

equally serious one, if a definition of 'change' were attempted which should satisfy Dr. Montague's requirement that the 'change produced in a conscious state . . . varies directly with the stimulus causing it, also varies inversely with the content in which it is caused.' Clearly the definition must involve not only the amount of incoming sensation but also the amount already present; but this last involves considering the amount which is all the time disappearing from consciousness, a quantity which I believe that Dr. Montague does not speak of. It is furthermore absolutely necessary to define the condition under which a given sensational element is said to belong to the 'objective content'; how long will it remain 'objective,' and when will it pass over and become a part only of the 'subjective aspect'? Until these two 'aspects' are exactly defined in relation to each other and the meaning of 'change' in these 'aspects' is defined, I can not see how anything at all can be said about the value of the derivative of a change in either kind of content. In short the function, even when ascertained, is, as likely as not, to be undifferentiable; in which case it would be meaningless to speak of a derivative.

The foregoing criticisms concern only the application of the differential calculus to the entities which Dr. Montague posits, and it may be that he could overcome the difficulties mentioned and obtain that derivative which he requires. There would then be a more serious objection to offer, and that would relate to the *interpretation* of his ratio. This quantity might vary as the theory requires, and still not be a measure, or as Dr. Montague says a representation, of the specious present. The derivative of two variables has, of course a fixed interpretation; and this is in the case in hand bound to be a rate of change, or a rate of rate of change, et cetera. The desired solution will be at best some such rate of change. Now I submit that the specious present of consciousness is not a rate of change; nor can I find any meaning in the statement that the specious present is 'represented' by such a quantity. The specious present, as I apprehend it, is a number of conscious elements which somehow exist together; it does not mean for us any rate of change or the like, but it means a *number of objects* which are temporally successive but yet which are by us experienced together. The few succeeding notes of a melody of which we are conscious all together, are a case in point; they do not coexist in time, but they do coexist in us. These coexisting objects, however, are not to be confounded with a rate of change; not even by one who should not believe with Russell[1] and other mathematicians, that derivatives 'are never magnitudes but only real numbers.'

[1] Russell, B., 'The Principles of Mathematics,' Cambridge, 1903, Vol. I., p. 173.

If it should appear that Dr. Montague's theory does not solve the question, 'How is it that at any moment there can appear to be present several moments?' we may still return to the older solution. It is that several moments are in fact not present at any one infinitesimal point of time or moment. They are present all together in consciousness but not altogether in time, as the question paradoxically insinuates. How this can be so has been so clearly discussed by Professor Royce[2] that one may almost wonder at a reappearance of the problem. Even the plain experimental psychologist who takes no delight in metaphysical explanations, to say nothing of a philosopher and logician, ought to find no difficulty in defining a personality or a consciousness as such an entity as does not exist in any one infinitesimal moment, but which occupies time as an acre occupies space. The familiar concepts of second, minute, hour, day and year are so defined, and I can see no logical or practical difficulty in defining a consciousness in exactly the same way. If any one is minded to wonder how a whole year or a specious present of consciousness can 'exist at any one moment,' he will find a clear and simple solution of the difficulty in Professor Royce's essay.

EDWIN B. HOLT.

HARVARD UNIVERSITY.

ACCOMMODATION AND CONVERGENCE—A PROTEST

A DOCTORATE thesis is but a small item in the annual output of psychological literature. If, however, it is worth reviewing at all, the reviewer may be expected to discuss what it says rather than what it distinctly does not say. Dr. Wallin's review not only failed to give my paper its proper setting in the literature, but ascribed to me a position which the paper itself definitely rejects. Moreover, the reviewer has made various misstatements in referring to minor points. In his reply to my former protest, he arranged his defence under six headings (*Psychological Bulletin*, I., 6, pp. 208ff); these I shall consider in order.

1. He still insists that I accept nativism in part, notwithstanding the fact that I reject it *in toto*. Having failed to persuade him by direct statement, I will make use of an analogy. Let us suppose that a writer on visual sensation had concluded his paper with the statement: "The Helmholtz theory seems to explain color-mixture, but it fails to account for the other facts; Hering's theory covers all the facts so far as known. Moreover, a closer examination shows that

[2] Royce, J., 'The World and the Individual,' New York, 1901, Vol. 2, Lecture III.; specially pages 113–142.

not even color-mixture is satisfactorily explained by Helmholtz.'' Should we interpret this to mean that the writer accepted Helmholtz for color-mixture but followed Hering for the remaining facts? Not only does Dr. Wallin adopt this naïve procedure in interpreting my position, but when charged with misrepresenting my attitude towards nativism, he supports his interpretation by a judicious selection of extracts from my paper. If he had seen fit to extend his quotation to include the next succeeding sentence, his readers would have seen for themselves that his review is a travesty on the paper.

2. He still maintains that I confirmed substantially all the results of Hillebrand. Here are a few facts! (All observers of normal vision; all distances expressed in millimeters.) Hillebrand's records show that 500 was confused with 250; mine show that 500 was invariably perceived to be farther than 454. Hillebrand found no perceptible difference between 333 and 1,000; none of my observers ever failed to discriminate correctly between 333 and 403. Hillebrand's results show an inability to distinguish 200 from 1,000; all of my observers differentiated at least five intervals between these limits. Do I in these cases confirm Hillebrand's 'experimental results as such'?

3. The review stated that my apparatus was substantially the same as that of three of my predecessors. I replied that one apparatus could not resemble a variety of very different patterns. The reviewer in reply quotes my statement that my apparatus was the same as Hillebrand's. But did not Arrer and Dixon also employ apparatus?

4. The review stated that in Hillebrand's apparatus 'the eye localizes a black patch at a greater distance than a white' (p. 88). When I pointed out his error he quotes himself as saying: ''The eye localizes a black patch (or what not) at a greater distance than a white'' (p. 209). As a matter of fact, his modified quotation is as far from the truth as his original statement. Several hundreds of observations which he will find averaged and tabulated in my paper (pp. 178–182) testify against him.

5. The reviewer says (p. 210): ''I submitted that the line of accommodation may be one factor, etc.'' But he did not; he submitted that the 'range of accommodation' was a possible factor (p. 86). And it is clear precisely from his own reference to Sanford, that 'line of accommodation' and 'range of accommodation' are wholly different things.

6. There can be no harm in making suggestions for further work. My criticism of Dr. Wallin's suggestions was that they are already contained in the literature of long ago.

J. W. BAIRD.

CORNELL UNIVERSITY.

A NOTE IN REPLY TO DOCTOR PERRY

MY attention has just been called to an article in this JOURNAL, by Doctor Ralph Barton Perry, entitled 'Recent Philosophical Procedure with Reference to Science,' in which I am charged with 'indulging in considerable riddling of the conceptions of science,' censured for 'criticizing science negatively and not positively, and coupled with Professor Karl Pearson as 'furnishing convenient illustrations of reactionary tendencies in contemporary philosophy of science,' mine being 'the untenable position of refuting science in detail and his that of refuting philosophy in general.' Now, I, for my part, should be grateful to Doctor Perry, if he could, either privately or otherwise, cite instances in justification of his strictures of my procedure. My concern has been with Naturalism, which is a form of philosophy and not science, and a form of philosophy which scientific men—Professor Pearson among them—have done a good deal to expose. I have devoted two or three pages in my second edition (Vol. I., pp. 303–5) to this point, and will venture to refer anyone interested to these. Here I will content myself with saying that I have never referred to any scientific details except they were misconstrued by the naturalistic philosopher, and never without falling back on scientific specialists for support.

JAMES WARD.
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SOCIETIES

THE NEW YORK ACADEMY OF SCIENCES. SECTION OF ANTHROPOLOGY AND PSYCHOLOGY

THE regular meeting of the section was held on March 28 in conjunction with the New York Branch of the American Psychological Association. The afternoon session was held at the Psychological Laboratory of Columbia University, the evening session was held as usual at the American Museum of Natural History. The program was as follows:

Mental Resemblance of Twins: Professor E. L. THORNDIKE.

A report was made on the general results of a comparison of twins in tests of attention, perception, association, rate of movement, addition, multiplication and stature. The resemblances, as measured by a rough, preliminary method, were about .75. The amount of this resemblance that should be attributed to similarities in home training was apparently slight. There was no evidence in the

results to support the theory that twins fall sharply into two species, those very closely alike and those no more alike than ordinary brothers and sisters.

Measurements of the Mentally Deficient: Miss Naomi Norsworthy.

The paper was a report of some work done among one hundred and fifty mentally deficient children in two state institutions for the feeble-minded and in two of the special classes organized in the New York schools. The measurements taken were physical, such as height, weight and temperature, tests of maturity, as perception of weight and of form, tests of memory and tests of intelligence or the ability to deal with abstract ideas. The main conclusion reached was that the difference between idiots and people in general is less than has been commonly supposed, and is a matter of degree rather than of kind.

Color Contrasts: Dr. R. S. Woodworth.

Dr. Woodworth presented a modification of Hering's binocular demonstration of the 'physiological' origin of simultaneous contrast. If monocular fields of different colors, with a gray spot on each, be combined by the stereoscope, each gray retains the contrast color suitable to its own field, however the conscious background may vary as the result of fusion or rivalry of the two fields. The demonstration is readily extended to cover brightness contrast, by placing gray spots on white and black fields which are combined as before. To show that these effects are not the result of a binocular mixture of the gray with the opposite field, a number of gray spots may be scattered over one field, and the other field made particolored; the gray spots appear all alike, or nearly so, though binocular mixture would have made them differ.

New Apparatus and Methods: Professor J. McKeen Cattell.

(1) Kymographs were exhibited in which typewriting ribbons were applied to secure the records. Electro-magnetically moved points strike the paper tape, whose rate of movement may be adjusted, and a record is left by the slowly moving typewriter ribbon. Two forms were exhibited, in one of which the kymograph was driven by an electric motor and in the other by clock-work. In the latter the clockwork could be started and stopped by an electric current by an observer in another room. The kymographs, while not especially suited for drawing curves, are much more convenient than smoked paper or siphon pens for time records, such as rhythms, conflict of the visual fields, after-images, etc. (2) Instruments were shown by which a number of faint clicks could be given at intervals of a second for testing sharpness of hearing and defective hearing. Instead of giving the observer a continuous sound, such

as from the ticking of a watch, two, three, four or five faint sounds are made, and the observer is asked how many he hears. By this method errors from the common illusions in the case of faint sounds are avoided. (3) A method was exhibited for testing color blindness by the time it takes to distinguish one color from another. By the normal individual red can be distinguished from green in about the same time as blue from yellow, but it takes longer to distinguish red from orange. If the observer belongs to the red-green class of the color blind, he can distinguish blue from yellow as quickly as others, but not red from green. An instrument was shown by which the conditions of the railway service can be imitated, it here being necessary first to distinguish a certain color and then to make the proper movement.

The Time of Perception as a Measure of Differences in Sensation: Mr. V. A. C. HENMON.

The aim of the investigation upon which this paper is based is to measure qualitative differences in color by the time of perception. The colors taken as standards were red, orange and yellow, whose wave-lengths had been definitely determined. Equal intermediate steps betwen orange and red were produced by the mixture of pigments. Small squares of each of these colors, 3 x 3 cm., were mounted on cards side by side with red, and exposed to the subject by means of a drop-screen so arranged as to give almost instantaneous exposure. The subject reacts with the right or left hand according as the predetermined stimulus appears to the right or left. The registration is made with the Hipp chronoscope. The results of 6,000 reactions gave evidence of the validity of the method and the fruitfulness of the problem. Equal objective differences are correlated with differences for consciousness, showing a definite increase as the magnitude of difference is decreased.

The Daily Curve for Efficiency: Mr. H. D. MARSH.

Habits Based on Analogy: Professor CHARLES H. JUDD.

The Determination of the Habit Curve for Associations: Professor J. E. LOUGH.

A report of experiments made in the psychological laboratory of the school of pedagogy. It was found that the time required to write series of letter-equivalents when the 'key' of equivalents was not memorized, but was consulted as frequently as necessary, diminished as the associations between the letter-equivalents became more habitual. The curves representing the results of these experiments exhibit all the characteristics of the typical habit curve. Repetition of the experiment using new 'keys' shows little or no interference due to earlier associations, while with each succeeding

'key' the physiological limit was reached after a constantly diminishing number of trials.

A Neglected Point in Hume's Philosophy: Dr. WILLIAM P. MONTAGUE.

The paper aimed to show (1) that Hume (in Part IV., Section II. of the 'Treatise') had quite unwittingly furnished what from his own point of view should have been regarded as a logical deduction and justification—rather than the mere psychogenetic description, which it purported to be,—of the realistic belief in the independent and uninterrupted existence of sensible objects; and (2) that the *naïve realism* or positivism thus accidentally promulgated was, from both the scientific and the popular standpoint, a far sounder and more inviting doctrine than the empirical idealism or sensationalism with which Hume's name is usually associated.

Action as the Concept of Historical Synthesis: Mr. PERCY HUGHES.

Rickert's description of the content of history as reality is amended to read *past reality,* the past of evidence. From this definition the individual, objective, moving and continuous character of historic content follows; and further, the conception of action as descriptive of both historic content and historic synthesis. An historical synthesis is a past action that itself has created a certain synthesis of evidence; which the historian discovers. In such synthetic actions, 'simple' actions retain their individuality as means, stimuli or hidrances to the main action, *i. e.,* in a functional relation.

At the close of the afternoon session the members were invited to attend a lecture given at Columbia University by Professor John Dewey on 'The Psychologist's Account of Knowledge.'

JAMES E. LOUGH,
Secretary.

REVIEWS AND ABSTRACTS OF LITERATURE

La Philosophie en Amérique. Depuis les Origines jusqu'à nos Jours. L. VAN BECELAERE, O.P., Member of the American Philosophical Association. New York, The Eclectic Publishing Co., 1904. Pp. xvii + 180.

The book before us is the most complete presentation of the whole development of philosophy in America which has yet appeared. Several of the general histories of philosophy contain very brief sketches of this development, a number of articles in periodicals have summarized it, and there are several studies of special periods which are more complete than the corresponding discussions in the present volume; but there is no one work which covers the whole field so well as this. The author has

attempted a brief exposition of the evolution of our philosophical thinking with its relations to the political, social and educational history of the country. Professor Royce stands sponsor for the book, and has contributed to it a very interesting introduction: an introduction which is an appreciation, and which, at the same time, points out most of the sins of omission and commission likely to be charged to the author by reviewers.

The book is a republication in a very much revised and completed form of a series of articles on philosophy in America recently contributed by the author to the *Revue Thomiste* (Paris). It opens with a discussion of the American spirit and its relation to speculative thought. He finds in America a most pronounced type of Anglo-Saxon philosophy. This philosophy, he tells us, is characterized by a practical tendency; it is a realistic and positivistic philosophy, not a philosophy of great metaphysical flights and unlimited horizons. He does not, of course, contend that this realism has been universal; indeed he perhaps underestimates its influence at the present time. Professor Royce suggests that 'barren realism' has not been universal at any time in our history.

Aside from this realistic tendency, Father van Becelaere finds responsiveness, accessibility to ideas from without, the most striking characteristic of our philosophical development. In philosophy, as elsewhere, he notes the presence of 'a most marked individualism tempered by perfect self-control and subject to a conscientious respect for the rights of others,' the distinctive trait of the national character.

His method of treatment appears very clearly in the first chapter of the historical discussion—and it is confessedly historical and not critical. He gives us in outline the general situation in matters social, educational and religious, and attempts, with some success, to relate the philosophical productions of the period to these.

Franklin as 'a type, an incarnation of the American spirit,' Jonathan Edwards as 'the greatest in philosophical speculation' and President Samuel Johnson as 'the most remarkable expositor of Berkleyanism outside of England,' are, of course, the central figures. The exposition of their views is clear and well proportioned.

Following the Colonial Period comes the period of 'the Scotch influence.' The religious influence in the colleges and the general demand for a 'sound' philosophy made way for a ready adoption of the Scottish philosophy introduced by Witherspoon. Its reign lasted till 1860 and it has retained much influence during the period of decline since that date.

As representatives of this general spirit rather than as members of the school, he mentions Wayland, Hickok, Porter and others. He admits that some of them were much influenced by other lines of thought, and that a few can hardly be included here with justice; still there is a likeness in the points of view of all these men. The great importance of Hickok and Porter is duly recognized.

The influence of the German philosophy, which came next in order, was introduced indirectly by way of the French eclectics on the one hand, and Coleridge, Carlyle and Wordsworth on the other, and directly by

Americans who had studied in Germany. This fell in with the intellectual revival in New England which found expression in Unitarianism, attempts at social reform and transcendentalism. Emerson, who had 'ideas and conceptions,' 'not a philosophy,' receives due consideration as the central figure in the transcendentalist movement.

Contemporary 'schools' are classed as idealistic. Lotze, Hegel and Green are pointed out as our favorite philosophers. Here it is possible to object that Father van Becelaere has perhaps underestimated the force of the realistic currents, though it is true that the names most widely known represent 'idealistic' tendencies. The present book is not altogether free from the fault of most discussions having to do with 'idealism,' viz., vagueness in the use of the term. One is almost tempted to demand the banishment of a word that so often means half a dozen different things on as many different pages. It usually seems to stand, in a general way, for everything that is supposed to be good, whether in ethics, metaphysics, epistemology, esthetics or what not. This book sins perhaps less than most in this respect.

The survey of Logic at the end of this chapter might well include some reference to Aikins' recent book.

The chapter on the philosophy of evolution is good, though to class Schurman with Agassiz and Dawson as an opponent of evolution is misleading. The fact that Schurman would limit the application of evolution in ethics gives no warrant for calling him an opponent of evolution.

Ethics, biology, anthropology, sociology and religious literature find mention, while psychology has a chapter to itself.

One looks in vain for any discussion of the important work of Thorndike and others in comparative psychology; Titchener's volumes on experimental psychology and Santayana's work in esthetics should have been noted.

It is doubtful whether all our psychologists would agree that 'psychology has been placed on an experimental basis only in order to assure to speculative psychology a foundation and guarantee in the facts and the control of those facts.'

A review of the situation at present includes an outline of the work done in some of the universities and a discussion of the aims and character of the various societies and journals.

A number of minor errors occur which need not be discussed in detail. Indeed, most of the things here criticized are matters of secondary importance. The most important omissions are pointed out by Professor Royce in his introduction, viz., the 'Chicago School,' and C. S. Peirce and his school. The Yale school, too, he insists has not received the attention it deserves. But on the whole the book is well balanced and well proportioned; and, to call attention to another fact pointed out by Professor Royce, it is fair-minded and free from bias. It is a very valuable addition to the literature of philosophy in America.

ADAM LEROY JONES.

COLUMBIA UNIVERSITY.

A Theory of Time-perception. W. P. MONTAGUE. *American Journal of Psychology,* Vol. XV., No. 1, pp. 1–13.

The author has formulated the problem of the 'specious present' in the question, 'How is it that at any one moment there can appear to be present several moments?' The author points out that there is a difference in the change-rate of the particular contents of consciousness and of the general state of consciousness, and that the amount of perceived time is measured by a finite differential ratio between these two changes.

Every psychosis may be considered as made up of two inseparable aspects, the objective and the subjective, the former being the content of consciousness which is the object of attention, the latter the whole system of conscious contents, including the incoming content. This incoming content is perceived as an object only as projected on a subjective background of pre-existing states. These two phases of a psychosis exhibit differing rates of change. A change in one conscious state is necessarily attended by a change in the system of states of which that one is about to form a part, but the change in this one state is greater than that in the system of states. The perception of a change undergoes modification less rapidly than the change that is perceived.

Now, although the time in which these changes take place and the changes themselves may be infinitely small, yet the ratio of the one to the other remains finite. This ratio may be represented by $\frac{do}{ds}$ o and s being respectively the objective and the subjective aspects of the psychosis. When this ratio is greater than unity, finite portions of time and change are perceived. When this ratio increases, *i. e.,* when $\frac{d^2o}{ds^2}$ is positive, the specious present seems to increase; when the ratio decreases and the second differential is negative, the specious present seems to decrease.

The *value* of these second differentials marks the perceived *rate* of time. Just as $\frac{s}{o}$ varies as $\frac{do}{ds}$ so do the first and second differentials vary inversely, and, the longer an event endures, the greater the value of $\frac{do}{ds}$ and the less the value of $\frac{d^2o}{ds^2}$ the rate of change. The further past an event is, the more slowly does it increase in pastness, a conformity of time-perception to Weber's law.

The rhythmic character of consciousness results from the change in the specious present. The specious present tends to increase, but soon this tendency is counterbalanced by the inability to attend to a larger number of things; the degree to which each thing is attended is inversely proportional to the number of things. The time comes when we can not attend to the content if it is extended, and so a new present is built up about a new sensation as center.

True memory differs from this sort of immediate consciousness of the past, (1) because the remembered event is projected upon a subjective background very hazy and purely schematic; and (2) because the remem-

bered event is less noticeably projected upon the concrete background of the specious present in which the act of memory takes place. Familiarity is an experience of the present with a fringe of the past; memory is an experience of the past with a fringe of the present.

To meet a possible difficulty, the author considers the question: 'What subjective background has a single sensation which arises when one is aroused from a state of unconsciousness?' The background for such a sensation, after its origin, would be composed of the image-traces of the sensation itself. Before such a background has developed, the background must be composed of the physiological concomitants of the sensation. The symbol for the specious present, taken physiologically, may thus represent a condition just antecedent to perception. In this way we can understand how it is that the time-form of a psychosis arises simultaneously with its content.

A. L. T. GOULD.
YALE UNIVERSITY.

JOURNALS AND NEW BOOKS

REVUE DE PHILOSOPHIE. May, 1904. Pp. 519–642. *Un Caractère de la Philosophie Moderne: le 'Mathematisme'* (pp. 519–541): X. MOISANT. – The attitude of Spinoza and Leibniz, culminating in the present worship of mathematical symbolization in philosophy is like a group of barren rocks in an otherwise fertile soil. It is only materialism over again; it reduces spirit to body. *La Théorie Physique, son Objet, sa Structure* (2d Article) (pp. 542–556): P. DUHEM. – A physical theory represents a group of experimental laws as simply, completely, and exactly as possible; an economical classification. We have a natural *faith* that these theories have ontological validity; this is confirmed because they enable us to predict. *Sur la Matérialisme Scientifique (suite)* (pp. 557–567): P. VIGNON. – Phenomena of mimicry are explained by the very psychic factors (will) which M. Le Dantec calls epiphenomenal. Thus we recognize Cl. Bernard's 'directive idea.' What this really is remains to be determined (*à suivre*). *L'Abstraction Scolastique* (pp. 568–573): COMTE DE VORGES. – Reply to M. Bernies. The evidence for the intellectus agens lies in its necessity as a basis for thinking; of course it is not observable. Neither is the heart-beat, normally, yet being indispensable for life we believe in it. *Fénelon Métaphysicien (Oeuvres Inédits)* (pp. 574–597): E. GRISELLE. – This gives the text of Fénelon's remarks on the 'Nature of Man explained by simple notions of Being in general' at the end of his *Lettre sur le culte interieur et exterieur* (*à suivre*). *Analyses et Comptes Rendus:* Félix Thomas, *Pierre Leroux:* C. HUIT. E. Lambert, *Fonction du Droit Civil Comparé:* CH. B. E. Fournière, *Les Théories Socialistes au XIX^e Siècle. De Babeuf à Proudhon:* E. BARON. N. Kostyleff, *Esquisse d'une Évolution dans l'Histoire de la Philosophie:* R. A. DUFF, *Spinoza's Political and Ethical Philosophy:* H. LÉARD. M. Salomon, *Collection des Grands Hommes de l'Église au XIX^e Siècle: Mgr. Dupanloup:* TH. G.

J. Lemaitre, *Théories et Impressions:* T. DE VISAN. J. Bourdeau, *Les Maîtres de la Pensée Contemporaine:* T. DE VISAN. Périodiques Français. Sommaire des Revues. Bulletin de l'Enseignment Philosophique: les Sensations Kinesthésiques. Chronique.

REVUE PHILOSOPHIQUE. No. 5, May, 1904. Pp. 449–568. *De la Verité: Remarques Logiques* (pp. 449–461): A. NAVILLE. – Truth is not agreement of thought with its object, for thought can not resemble matter or space. Truth for us, relative truth, is agreement of thought with normal representations. Sigwart's 'necessity' holds only for the normal. *La Perception de la Verticalité de la Tête et du Corps* (pp. 462–492): B. BOURDON. – Evidence is against a 'static sense' in the internal ear. Verticality or inclination of the head is revealed by eye-movements and sensations in the neck; of the body by sensations of the legs and haunches; of both, by skin and muscular sensations. *La Conception Générale de l'Association des Idées* (pp. 493–517): H. PIÉRON. – The Scotch theory and the stream theory are both inadequate. Associations are determined by the state of mind as a whole system. Two states once joined in any sort of system tend to recall each other. *Notes et Observations: de la Conscience des Agonisants* (pp. 518–521): N. VASCHIDE. – In the case of an epileptic, four minutes dead, a friend crying loudly in her ear caused the eyelids to quiver. Sufferers frequently show this reflex to auditory sensation. *Revue Critique: Vers le Positivisme Absolu par l'Idéalisme, de L. Weber* (pp. 522–539): L. BRUNSCHWIGG. – Weber's reduction of spatial realism to positivistic idealism is good, but he neglects to apply this to the categories of action and leaves open the road to moral realism. *Analyses et Comptes Rendus:* Aikins, *Principles of Logic:* A. LALANDE. Couturat, *Histoire de la Langue Universelle:* A. L. Roussel-Despierres, *L'Idéal Esthetique:* L. ARRÉAT. Lipps, *Aesthetik. Psychologie des Schönen und der Kunst:* M. KREBS. Durkheim et collaborateurs, *L'Année Sociologique:* G. BELOT. Dody, *Le Critérium Sociologique de la Raison d'État:* J. DELVAILE. Penjon, *L'Énigme Sociale:* H. DAUDIN. Payot, *Cours de Morale:* DELVAILLE. A. Bosco, *La Delinquenza in Vari State di Europa:* G. RICHARD. G. Trespioli, *Saggio per uno Studio della Coscienza Sociale e Giuridica nei Codici Religiosi:* RICHARD. V. Miceli, *Studi di Psicologia del Diritto:* RICHARD. N. Vaschide et von Buschan, *Index Philosophique. Revue des Périodiques Étrangers. Nécrologie. Livres Déposés.*

VIERTELJAHRSCHRIFT FÜR WISSENSCHAFTLICHE PHILOSOPHIE UND SOZIOLOGIE. March, 1904, Band III., Heft 1. *Egoismus und Altruismus. Zur soziologischen Motivation des praktischen Wollens. Einleitender Teil* (pp. 3–22): D. GUSTI. – The origin of the two terms. Comte's treatment and Spencer's. Human actions can not be classified on so simple a basis. The error arises from adopting an historical, not a psychological account of motives. *Schopenhauer u. die wissenschaftliche Philosophie.* I. (pp. 23–71): C. v. BROCKDORFF. – Schopenhauer's theory of matter gave the first impetus to Ostwald's en-

ergetics. To his high valuation of the subjective element in consciousness psychology is much indebted. But his supposition that the sensible universe flies about in endless space is based not on logic but on pessimism. His account of causality, matter and force is utterly insufficient. The philosopher he considered an artist, concepts as his marble. *Über die Entwickelung des Begriffes der höheren arithmologischen Gesetzmässigkeit in Natur- u. Geisteswissenschaften* (pp. 73–92): W. G. ALEXEJEFF. – This development shows us that experiment gives us but the axioms of the facts. Further solutions of the subtler conformities of existence and sequence wait for the development of mathematics. *Critical Notices,* by W. P. SCHUMANN. W. Ament, *Die Entwickelung der Pflanzenkenntnis beim Kinde und bei Völkern.* K. Brankmann, *Die psychologische Entwickelung und Pädagogische Behandlung schwerhöriger Kinder.* W. Ament, *Begriff und Begriffe der Kindersprache.* P. Bergemann, *Lehrbuch der Pädagogischen Psychologie.* K. Kroiss, *Zur Methodik des Hörunterrichts.* E. F. W. Meumann, *Die Sprache des Kindes.* Havelock Ellis, *Das Geschlechtsgefühl:* GIESSLER. G. Ratzenhofer, *Positiv Ethik:* L. ROTH-DIAKOVAR. P. Sokolowski, *Die Philosophie im Privatrecht:* E. RABEL.

ANNALEN DER NATURPHILOSOPHIE. April, 1904. Band III., Heft 3. *Das Duale System der Harmonie* (*pp. 241–269*): A. v. OETTINGEN. – A systematic account of the chief terms employed in acoustics, with special emphasis on the distinction between tonicity and phonicity. *Über die Wechselseitigen Beziehungen der Bewegungsenergie und der Strahlenergie* (*pp. 270–282*): V. v. TURIN. – The results of the enquiry are summed up in ten theses, which include an approximate formula for the conversion of radial into kinetic energy. *Neue Ableitung der Gibbsschen Phasenregel* (*pp. 283–293*): F. WALD. – An attempt to show that the experimenter is included among the number of substances in Gibb's formulation of the law of phases. *Biologie und Chemie* (*pp. 294–314*): W. OSTWALD. – The most general advance exhibited in history is the conquest of spiritual realms, including that of art, by science. The enjoyment of art as a relief from the labors of science is an atavistic survival. The general trend of science has become synthetic. In the problem of coordination biology has a task which differentiates it from Chemistry. *Über den Zweck des Lebens* (*pp. 315–323*): P. J. MOBIUS. – Like everything interesting, the problem is a transcendent one. Existence is doubtless the chief aim, but it is not the whole. *Zur Geschichte tierischer Gesellschaften* (*pp. 324–338*): E. METSCHNIKOFF. – The connection prevailing among lower social animals between specialization in labor, and sexual power does not seem likely to prevail among men; nor is loss of individuality in other respects a corollary of social organization. *Critical notices:* W. O.-Felix Rosen, *Die Natur in der Kunst.* Th. Ribot, *Die Schöpferkraft der Phantasie* (L'imagination créatrice). M. Ettlinger, *Untersuchungen über die Bedeutung der Deszendenztheorie für die Psychologie.* R. Goldschied, *Zur Ethik des Gesamtwillens Erster Band.* L. Couturat et L. Leau, *Histoire de la langue universelle.* C. K. Schneider, *Vitalismus. Elementare Lebensfunktionen.*

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NOTES AND NEWS

We reprint the following note from *Nature:* "The first German congress for experimental psychology was held in Giessen on April 18–21. About 130 persons accepted the invitation to attend the congress, including most of the prominent psychologists of Germany, besides physiologists, philosophers, alienists and teachers attached to various institutions, and about one hundred attended the sittings. Nearly fifty papers were read and discussed, and in order to get through this large programme the sittings were continued far into the evenings. There was an excellent exhibition of apparatus arranged by Doctor Sommer, the distinguished professor of psychiatry, who has done so much to apply the methods of experimental psychology to the investigation of mental diseases. Professor G. E. Müller, of Göttingen, so well known for his accurate investigations of the memory, presided over the sittings, and one of the most interesting features of the congress was his demonstration and exposition of a case of exceptionally good memory. The subject, who is an intelligent and well educated man, has, in addition to a remarkable memory, principally visual in type, a power of seizing very rapidly various arithmetical relations between groups of figures presented to him, and this combination of faculties enables him to excel all the achievements of Diamanti, Inaudi, and the other 'arithmetical prodigies' that have been investigated from time to time. It is proposed to institute a German association for experimental psychology for the organization of annual congresses and of cooperative research."

Following the resignation of Professor Dewey from the headship of

the department of philosophy at the University of Chicago, to accept a chair of philosophy at Columbia University, a reorganization of the work at Chicago in philosophy and psychology will be made. The work in psychology will be organized under a distinct department, with Professor James R. Angell, professor of psychology, as head. Associated with him will be Doctor John B. Watson, as instructor, and courses in comparative psychology will also be offered by Professor Mead and in the psychology of religion by Doctor Ames, both of the department of philosophy. Professor James H. Tufts will be head of the department of philosophy, and Assistant Professor A. W. Moore has been promoted to an associate professorship in the department. Associate Professor Mead and Doctor Ames will continue with the department. Courses in Greek philosophy will be given by Professor Shorey, of the Greek department. The organization of the work in education, which has hitherto been connected with the department of philosophy, has not yet been fully determined upon.

THE Northwestern branch of the American Psychological Association held its semi-annual meeting at the University of Chicago, Saturday, May 7, with Professor A. W. Moore in the chair. The following papers were read: 'Image or Sensation?' by W. C. Gore; 'Report on Recent Neurological Work,' by H. H. Donaldson; 'An Illustration of Psychology as Metaphysical Method,' by S. F. MacLennan; 'Report of Experiments on the Relation between Sensations of Taste and Smell,' by Matilda Castro. After the reading and discussion of the papers the Association adjourned to the Quadrangle Club for dinner. Professors Scott, Tufts and Tawney were elected a Committee in Charge of the next meeting, which is to be held at Northwestern University, on the Saturday following Thanksgiving.

AT a congregation of the University of Cambridge, England, on April 29, the report of the General Board of Studies recommending that the benefaction offered by Doctor Stanton, Ely Professor of Divinity, for the endowment of a lectureship in the philosophy of religion be gratefully accepted by the Senate, and that the vice-chancellor be authorized to express to Doctor Stanton the thanks of the University for his gift, was approved. Also the regulations for the appointment of a University lecturer in the philosophy of religion were adopted.

PROFESSOR WILLIAM TURNER, of St. Paul Seminary, St. Paul, Minnesota, has been granted a year's leave of absence which he intends to spend in Europe for the purpose of securing material for a study of the beginnings of scholasticism.

PROFESSOR WILHELM HISS, professor of anatomy at Leipzig, died on May 1, at the age of seventy-two years.

IT is announced that Professor George Trumbull Ladd has resigned his chair of philosophy at Yale University.